Long Term Underwater Radiated Noise Mitigation Plan
Message from the CEO

As a stakeholder in the Salish Sea, BC Ferries has a responsibility to understand how our activities may affect whales in general and the southern resident killer whale (SRKW) in particular. BC Ferries has been an early and active participant in efforts to understand and mitigate the effects of underwater radiated noise (URN).

We have been taking action. We have engaged scientists to make baseline measurements of our ship’s key URN characteristics, loudness, duration and tonal spectrum relative to modes of operation. We need to know what we are emitting so we can address it.

BC Ferries is actively reducing our URN. Each new class of ship we build is generally quieter than the ships before it. We do this through improvements in hull design to reduce noise from wave making, using alternative propeller styles that are less prone to cavitation, and by placing ship’s equipment on resilient mounts to reduce structure-borne noise. Taken together, these features can significantly reduce loudness and frequency.

This is going to be a long process. We build our ships to operate for decades, more than 50 years in some cases. New, quieter ships will therefore arrive gradually in the Salish Sea. However there are opportunities coming soon, such as the replacement of our older C-Class vessels, which will be built between 2022 and 2030. BC Ferries will do all it can to make those the quietest large vessels we have ever built.

Our deck crews are always on the lookout for whales and have standing permission to deviate away from whales at the captain’s command when safe to do so. Vessels can also slow down, especially if course deviation is not possible in confined waters. Not all vessels grow quieter when they slow down but slowing down can be beneficial for some.

All our ships operate according to the “Mariners Guide to Whales, Dolphins and Porpoises” a copy of which you will find in every wheelhouse of every ship in our fleet. We continue to work with scientists and whale researchers to identify new ways in which we can operate our ships to protect whales while still meeting our obligations to the communities we serve.

Reducing our environmental footprint through continued investment in leading-edge practices related to environmental stewardship is a top priority for BC Ferries. Our environmental, social and economic impacts are central to our business decisions.

Mark Collins
BC Ferries’ President & CEO
Salish Orca,
Our quietest vessel class
Introduction and Background

 Until very recently, URN has not been a measured vessel performance parameter in the commercial marine sector. At this time, there is no limiting standard for URN emissions from Transport Canada (TC) or the International Maritime Organization (IMO). URN is one of several factors contributing to the at-risk condition of the SRKW population inhabiting certain waters in which BC Ferries operates. Legal protections in the Species at Risk Act compel the fast tracking of mitigation measures in Canadian waters of the Salish Sea. SRKW habitat extends south of the Canada/U.S. border. Washington State executive order EX-18-02 requires the development of “strategies for quieting state ferries in areas most important to Southern Residents.”

 Similar to air quality management, it is both the point source and the accumulative effects of URN that must be managed to mitigate impacts. Vessel point sources of URN are propellers, thrusters, hull drag, engines and on board machinery.

 The BC Ferries fleet is a significant contributor in the Canadian Salish Sea due to sheer number of vessels, time on the water and vessel configuration/mode of operation. A ferry at service speed is typically emitting URN at a broadband sound intensity of 185 dB. The quantitative studies within the science community indicate that vessels operating at sound intensity above 175 dB are the candidates for reducing overall noise levels in the SRKW habitat.

 The goal for BC Ferries URN plan is:

To reduce underwater radiated noise while maintaining safe, reliable and sustainable operations and to strive for a 50 per cent reduction of overall URN which is consistent with global targets.
Undertakings

In April 2014 IMO issued a noise reduction guideline MEPC.1/Circ.833 which proposes measurement standards, elements of vessel design and speaks to vessel speed. In September 2014, BC Ferries became a founding member of the Port Vancouver Enhancing Cetacean Habitat and Observation (ECHO) program advisory working group.

BC Ferries has advanced the following initiatives independently and in collaboration:

- In May 2015, BC Ferries conducted a full URN trial measurement of a Coastal Class ferry, including at reduced speeds
- In 2015, developed a Marine Mammal policy and best practices for vessel operation
- From 2015 to 2017, increased BC Ferries fleet participation in the established BC Cetacean Sighting network administered by the Coastal Ocean Research Institute
- In 2015, completed DFO hydrophone installations within approaches to BC Ferries terminals (Tsawwassen, Sturdies Bay) for mammal detection and research. In 2016 to 2018, installed more DFO hydrophones (Comox, Powell River, Klemtu)
- From October 2016 to June 2017, seven BC Ferries vessels were measured and analyzed within the ECHO program
- In August 2017, BC Ferries conducted URN measurement of eight vessels in the Swanson Channel study, including at reduced speeds
- BC Ferries has contributed to the development of the following:
  - Mariner’s Guide to Whales, Dolphins and Porpoises
  - Marine Mammal policies of other ferry operators
  - Whales in our Waters Tutorials
  - Whale Report Alert System (WRAS)
  - Green Marine Certification Performance Indicator for URN
  - Class Notation Guides for URN
Current Situation

We have URN characteristics for almost every BC Ferries vessel operating in the most frequented waters of SRKW habitat. Our objective, to build a quieter vessel, will strive to adapt technical solutions to SRKW sensitivities.

Factors we are considering are:

- Killer whale call intensity ranges up to 140 dB
- A ferry at service speed is typically emitting URN at a sound intensity of 185 dB
- 185 dB @ 1m from point source can dissipate (spherical spreading effect) to 143 dB at 128 m distance (6 dB for each doubling of distance) and 125 dB at 1 km distance

<table>
<thead>
<tr>
<th>Sound Intensity</th>
<th>dB @ 1 m</th>
<th>175</th>
<th>180</th>
<th>185</th>
<th>190</th>
<th>195</th>
<th>200</th>
</tr>
</thead>
<tbody>
<tr>
<td>travel distance from source</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>125 m</td>
<td>133</td>
<td>138</td>
<td>143</td>
<td>148</td>
<td>153</td>
<td>158</td>
<td></td>
</tr>
<tr>
<td>250 m</td>
<td>127</td>
<td>132</td>
<td>137</td>
<td>142</td>
<td>147</td>
<td>152</td>
<td></td>
</tr>
<tr>
<td>500 m</td>
<td>121</td>
<td>126</td>
<td>131</td>
<td>136</td>
<td>141</td>
<td>146</td>
<td></td>
</tr>
<tr>
<td>1 km</td>
<td>115</td>
<td>120</td>
<td>125</td>
<td>130</td>
<td>135</td>
<td>140</td>
<td></td>
</tr>
</tbody>
</table>

- SRKW use sound for echolocation clicks to find prey and navigate (range 8,000 – 80,000 Hz) and in vocal communication for social and hunting coordination with whistles and calls (range 500 – 30,000 Hz)
- Ferry noise frequency varies from 2 Hz to 100,000 Hz and can interfere or mask SRKW communications and fish finding vocalizations

The SRKW population ranges on a seasonal basis from the Salish Sea south to the coastline of California. SRKW presence in the waters that BC Ferries operates in typically coincides with the summer peak operational period.
Guiding Policy and Strategic Objectives

BC Ferries’ vision is to be trusted and valued by the communities we serve. Our highest values are to be safe, caring, honest, collaborative, respectful and sustainable. Environmental impacts are central to our business decisions and we strive to co-exist harmoniously with the communities, creatures and environment around us.

Within the Salish Sea the SRKW species is iconic and valued by our Coastal Indigenous communities and the people of British Columbia. The guiding policy is to craft a relationship with the SRKW that promotes understanding of the species and is continually mindful of their plight.

**Strategic Objectives:**

- Vessel bridge teams are enabled with operational awareness of SRKW proximity alerts to apply impact mitigation options in daily voyage planning
- Vessel bridge teams understand the vessel specific URN characteristics and use this knowledge when navigating in the presence of SRKW to minimize impact
- Build quieter vessels within a sustainable fleet renewal program
- Reduce noise from shore side infrastructure in operations, maintenance and construction
- Reduce overall contribution of URN into the SRKW critical habitat against a 2016 baseline
- Take action on vessel design and operational strategies
Vessel Design Strategies

A. FLEET MASTER PLANNING

Objectives:

• Build quieter vessels within a sustainable fleet renewal program
• Reduce overall contribution of URN into the SRKW critical habitat against a 2016 baseline

Tactics:

• New vessel construction standards are to include Class Notations for URN, IMO Resolution MSC.337(91): Code on Noise Levels on Board Ships and MEPC.1/Circ.833 7 April 2014 IMO - Guidelines for the Reduction of Underwater Noise From Commercial Shipping
• Fleet Master Plan is to include new vessel design targets for overall URN and project specific URN reduction plans in the design phase that include:
  • Reduced propeller cavitation in higher frequency
  • Propeller wake field improvement
  • Reduced hull noise including propeller wash, wake wash and slapping
  • Dampening of noise from engines, reciprocating and rotary machinery and shafts
  • Design of overboard discharges and cooling water circulation
  • Reduction in the total number of noise emitting sources
Long Term Underwater Radiated Noise Mitigation Plan

B. RESEARCH AND DEVELOPMENT

Objectives:

• Build quieter vessels within a sustainable fleet renewal program

• Reduce overall contribution of URN into the SRKW critical habitat against a 2016 baseline

Tactics:

• Engage in research and development partnerships with commercial vendors that:
  
  • Support propeller/thruster suppliers in quieting commercial-grade propellers

  • Seek adaptation of quiet military and seismic designs

  • Support research of quiet hull and machinery designs

• Enable necessary science and technology validations through universities, governmental and industry institutes
Operational Strategies

A. ROUTE SERVICE OPERATIONS

Objectives:

- Vessel bridge teams are to be enabled with operational awareness of SRKW proximity alerts to apply impact mitigation options in daily voyage planning
- Vessel bridge teams understand the vessel specific URN characteristics and use this knowledge when navigating in the presence of SRKW to minimize impact
- Reduce noise from shore side infrastructure in operations, maintenance and construction
- Reduce overall contribution of URN into the SRKW critical habitat against a 2016 baseline

Tactics:

- Develop and enhance operational procedures specific to vessel route operations making use of resources including Mariner’s Guide to Whales, Dolphins and Porpoises and the Whale Report Alert System (WRAS) under development (complete)
- Establish a 2016 baseline for average overall source radiated noise levels (“RNL”) at service speed (complete)
- Establish ready access to URN measurement resources: high quality acoustic station equipment, data storage, analysis and reporting
- Measure and retain a report of source radiated noise levels (“RNL”) at service speed for any vessel deployed strategically to operate in designated critical habitat
- Frequency specific (tonal) noise source “peak” levels is to be used to track and mitigate if possible specific noise emission sources on board

B. EDUCATION AND COMMUNICATIONS

Objectives:

- Vessel bridge teams understand the vessel specific URN characteristics and use this knowledge when navigating in the presence of SRKW to minimize impact
- Reduce noise from shore side infrastructure in operations, maintenance and construction
- Reduce overall contribution of URN into the SRKW critical habitat against a 2016 baseline

Tactics:

- Continue to develop educational partnerships
- Engage and support initiatives fostering knowledge sharing, innovation and promotion of best practice between industry, Indigenous Communities’, government, and science and research communities
- Educate BC Ferries personnel on the means and benefits of URN mitigations